Helping the Warfighter One Nanotube at a Time

Seldon Laboratories, LLC

Alan G. Cummings
CEO

International Soldiers System Conference

December 2004

A Versatile Material with Many Defense Applications

Nanorope/
Tether

Purification of
Fluids:
- Water - Blood
- Fuel - Air

Signature
Managemen
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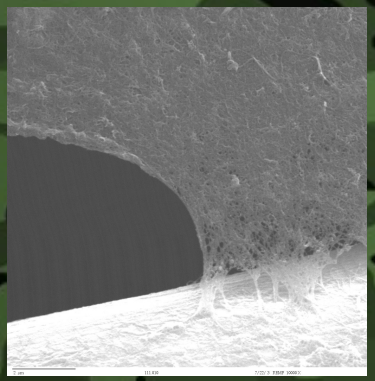

Fused Carbon
Nanotube Material

Chem/Bio

Detection

Nanocomposite
Structural
Materials

Ballistic
Protection

Multi-Functional
Cloth

Weapons, Energy,
Laser Eye Protection

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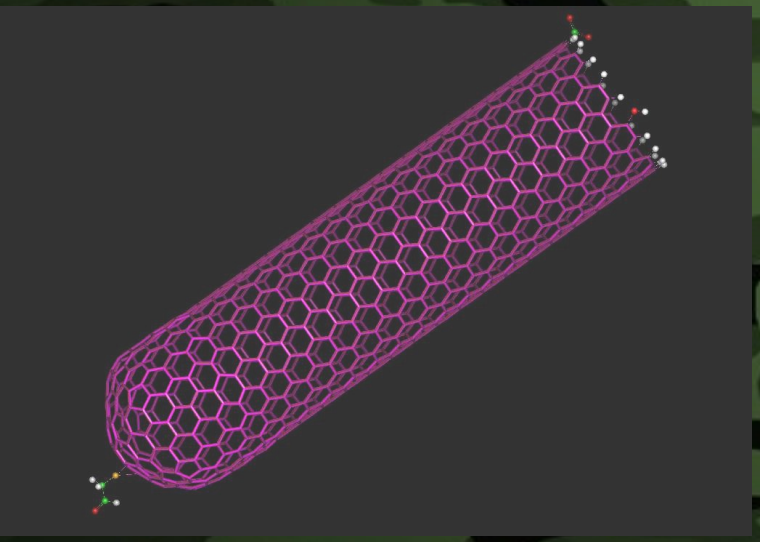
Carbon Nanotube – It's manipulation is Seldon's core competency



- 100 times the tensile strength of steel at 1/6th the weight
- Avg. size: 1-60 nm wide 1-200 microns long
- 7 - 10,000 times more electrically conductive than copper
- Thirty times the heat conduction of copper

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The Quest to Exploit the CNT

- Since its discovery less than 20 years ago, practical uses for its unique material properties have been hotly pursued
- Annual government/corporate research investments world-wide are substantial
- Few viable products currently exist that take full advantage of these properties

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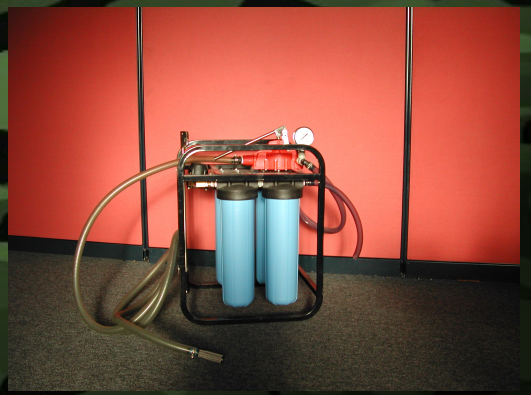
Seldon's first products with a fused carbon nanotube material are for water ion

Water Stick

Point of Use/Entry



Large Volume
Portable Field Unit

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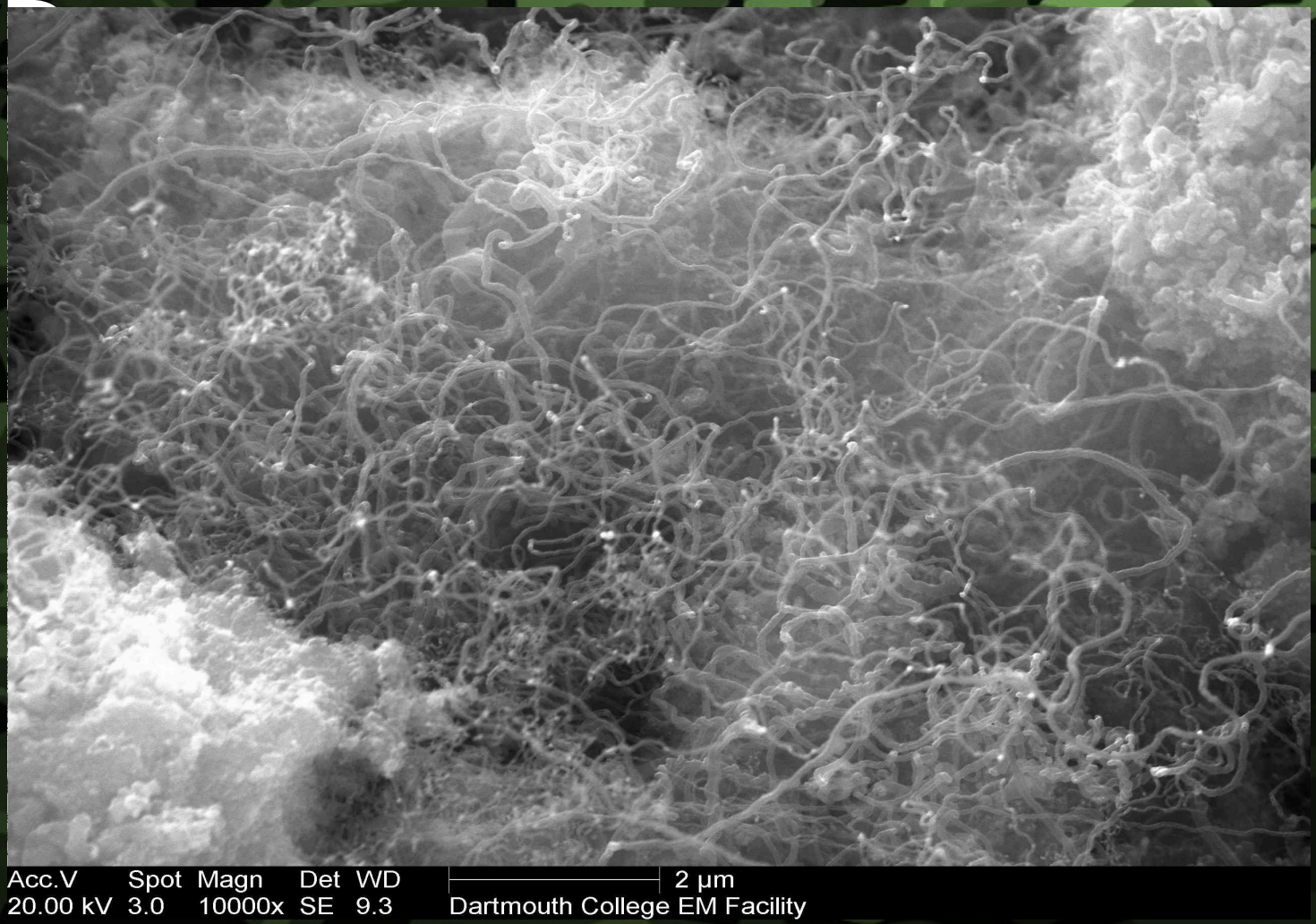
Competitive Advantages - Water

- Eliminates (kills) microorganisms to produce potable water without the use of:
  - Heat, Chemicals, Contact time
  - UV radiation, Power, Significant pressure
- Removes inorganics, e.g. lead, arsenic
- Immediate purification – fast flow
- Light weight
- Reduced operating costs

Development spiral for fused cnt

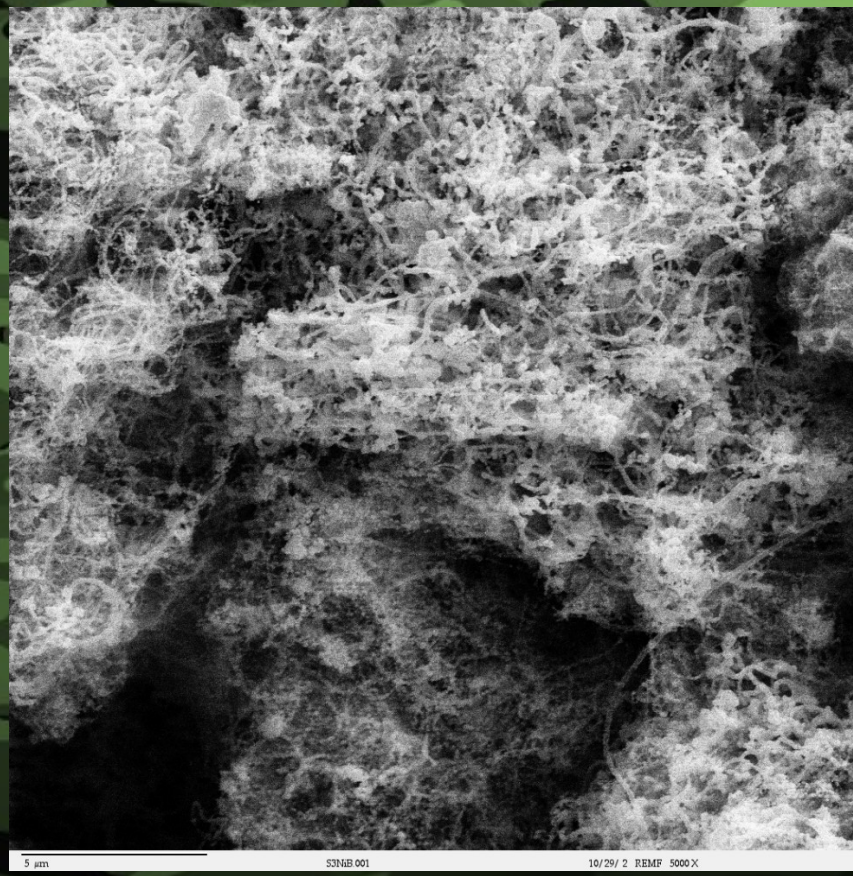
- Signature management based on surroundings
- Durable, tear-resistant, water repellant, and cool
- Integrated electrical circuitry and connectors
- Rapid heat transfer and solar shading
- NBC protection
- Ballistic protection

Seldon NanoMesh Key Material: Carbon Nanotubes grown in CV



Seldon's Breakthrough

- Developed a scaleable means of dispersing naturally conglomerating nanotubes
- Forced them to self-assemble into useful forms



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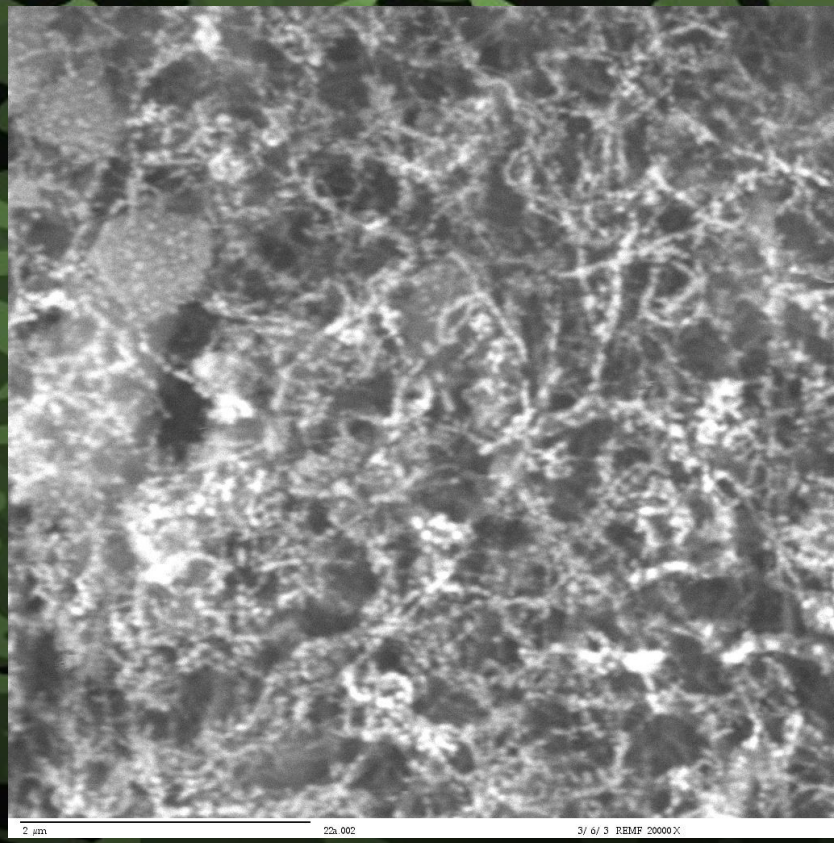
Fused carbon nanotube material

- A number of proprietary methods can be used to functionalize and then fuse the CNT's together
- Result: lightweight, fused cnt material



Layer by layer membrane construction

- Ultra thin layers possible
- Treatment and fusing together thin layers
- Material performance can be calibrated to suit particular needs

Material development to address the Need for strong, lightweight material for signature management

- Non –woven textile like material created, design for coatings/thin films
- Development spiral to be: signature management, NBC then ballistic materials
- Samples to be tested FY 05 for multiple military uses e.g. flexible, light weigh body armor system

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Puncture Resistance

- Multiple layers of robust cnt materials can be constructed using current methods for puncture resistance
- The blast mitigation properties of the material will be characterized in terms of energy adsorbed per unit impact area as a function of the mass of the affected composite material

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Material Compatibility

- Nanomesh material exhibits superior material compatibility permitting combinations
- Allows for integration of known force absorbing materials into nanomesh
- Ensures that the material can be easily bonded to other textiles to add new properties to existing fabrics

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Lightweight Material

- Depending on its construction, a given piece of the fused material is very light weight.

Thermal Conductivity

- Nanotube's thermal conductivity allows the construction of materials that can efficiently transport heat to:
  - Improve comfort for warfighter
  - Mask/pattern distinctive heat signatures of equipment, vehicles, and personnel

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Antimicrobial Properties

- As demonstrated in its application for water purification, the material attracts and destroys microorganisms in fluids
- Work is underway with the government agencies to construct textile like materials to defeat airborne Chem/Bio agents

Wearable Data Transfer

- Current wearable systems rely on wires and cables
- Nanomesh composed of aligned carbon nanotubes allows for significant electrical conductivity
- Insulators added in manufacture creates a web of pathways
- Seldon will test materials for this application in FY 05

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Conclusion

- Seldon proprietary technology produces textile like material
- Proven capacity to remove biological and chemical agents in fluids
- Multi-functional materials are in development for near term testing

Contact Information

Alan G. Cummings

CEO

PO Box 710

Windsor, VT 05089

802-674-2444

acummings@seldontech.com

www.seldontech.com